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HOLD THAT FLAVOR[1]

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It is a deep-rooted human instinct to grasp and hold the fleeting things of life. We fix a loved one's image on canvas or gelatin; we record the short-lived notes of a symphony and preserve a flower in impervious plastic. So, too, men have long tried to capture and thus prolong the enjoyment of the aromas of fresh fruit. This has now become a practical reality through research at the Department of Agriculture's Eastern Regional Research Laboratory in Philadelphia.

In 1944 two young chemical engineers, H. P. Milleville and E. L. Griffin, Jr., for the first time captured, in concentrated unaltered form, the volatile aroma of fresh apple juice. Their success can be largely attributed to a new approach. Most previous investigators had attempted to capture the aroma when concentrating the fruit juice under vacuum. Quite logically, vacuum was used to avoid heat damage to the juice or the aroma. However, consideration of the problem from a theoretical viewpoint showed that the losses in aroma from the vent gases of any volatile flavor recovery system would be almost inversely proportional to the absolute pressure in the system. They therefore abandoned the vacuum method and designed an apparatus to operate at atmospheric or higher pressure.

Their first process entailed heating the freshly pressed juice to about 320°F. in 3 seconds and then flashing it to atmospheric pressure. This vaporized about 10 per cent of the juice, which previous investigators had shown to be adequate for the release of all the aroma. The vapor passed to a fractionating column, where the aroma was concentrated to 100 or more times its concentration in the juice. Vent gases were scrubbed with the chilled product for more complete recovery. The resulting product was termed apple essence, since it contained the essential flavor ingredients characteristic of apples. This process was described by H. P. Milleville and R. K. Eskew.[4]

The apparatus would have had limited commercial value, however, because the tube in the superheater in which the juice was brought to the flashing temperature fouled rapidly, necessitating frequent shutdowns for cleaning. This drawback was overcome by substituting a rapid evaporator for the superheater. This innovation made the process commercially practical. It was described in a supplement to AIC-63. A later publication by Milleville and Eskew[5] describes the process essentially as it is carried out today.

The original object of this work was to obtain the volatile aroma of apple juice in such concentrated form that when added to a concentrate made from the stripped juice the product would have a high enough sugar content to prevent fermentation. This was achieved, and the product was termed full-flavor concentrated apple juice. It was soon apparent, however, that there were other uses for apple essence, for example, in enhancing the flavor of frozen concentrates, carbonated beverages, jelly, candy, ices, etc.

The new process met with enthusiastic response on the part of industry, and commercial development was expanding rapidly when it was found that the essence contained ethyl alcohol in sufficient quantity to be taxable. Ethyl alcohol is a component of apple flavor, and when the flavor is concentrated, the alcohol is increased enough to exceed the taxable limit of 0.5 per cent. This dampened the enthusiasm of industry for a while, but in September, 1949, the tax on volatile fruit concentrates, as essences are now termed, was removed. Thousands of gallons of volatile fruit concentrates made by the process developed at the Philadelphia Laboratory are now being produced and the new industry is expanding.

Volatile fruit concentrates are not confined to apples. The Laboratory also showed that the basic principles of the apple essence process could be applied to the juices of many other fruits, such as Concord grapes, blackberries, black raspberries, and strawberries. Now the essences of many fruits besides apples are being produced commercially.

Anyone who has been in the kitchen when preserves, jams, or jellies are being made knows that the air of the kitchen is pervaded with the aromas of cooking fruit. True, these are different from those of the fresh fruit, but they are pleasing and potentially valuable. The Eastern Regional Research Laboratory is currently studying the recovery in concentrated form of the aromas given off during the commercial manufacture of jams, jellies, and preserves. These recovered aromas should enhance the flavor of the finished product and may find use in other foods and beverages.

The astonishingly rapid growth of the frozen concentrated orange juice industry may encourage the

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[1] Report of a study, certain phases of which were carried on under the Research and Marketing Act of 1946.

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[4] Milleville, H. P., and R. K. Eskew, "Recovery and utilization of natural apple flavors," U. S. Dept. Agr., Bur. Agr. and Ind. Chem. AIC-63, Sept. 1944. (Processed.)

[5] Milleville, H. P., and R. K. Eskew, "Recovery of volatile apple flavors in essence form," Western Canner and Packer, Oct. 1946.

development of other frozen juice concentrates. ...e do fruit essences fit into this picture? Using ...sence from eastern varieties of apples, the Philadelphia Laboratory has made frozen concentrated apple juice which, when diluted with water, yields a product with all the flavor and aroma of the fresh juice. At the Western Regional Research Laboratory in Albany, California, essence from western varieties of apples has been similarly used. Employing grape essence, the Philadelphia Laboratory has also prepared frozen concentrated Concord grape juice. When water is added, the product is comparable in quality with the highest grade bottled grape juice.

Several research laboratories of the Bureau of Agricultural and Industrial Chemistry are studying various aspects of recovery of the volatile flavors of fruits grown in their respective regions.

The frozen orange concentrate now on the market is a high-grade product, and public acceptance has been enthusiastic. Could that product not be still better if orange essence were used to contribute the characteristic orange aroma to the product instead of a small amount of fresh orange juice as is now used? This possibility will not be overlooked in the research program of the Bureau of Agricultural and Industrial Chemistry.